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Imazeki

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[54] **REMOVABLE ROD ANTENNA**

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[51] **Int. Cl.**[4] **H01Q 1/24**

[52] **U.S. Cl.** **343/702**; 343/888; 343/900

[58] **Field of Search** ..... 343/702, 900, 901, 906, 343/715, 905, 878, 880, 888, 889; 339/126 J, 129, 130 R, 130 C; 403/195, 197; 174/138 A, 152 A, 153 A

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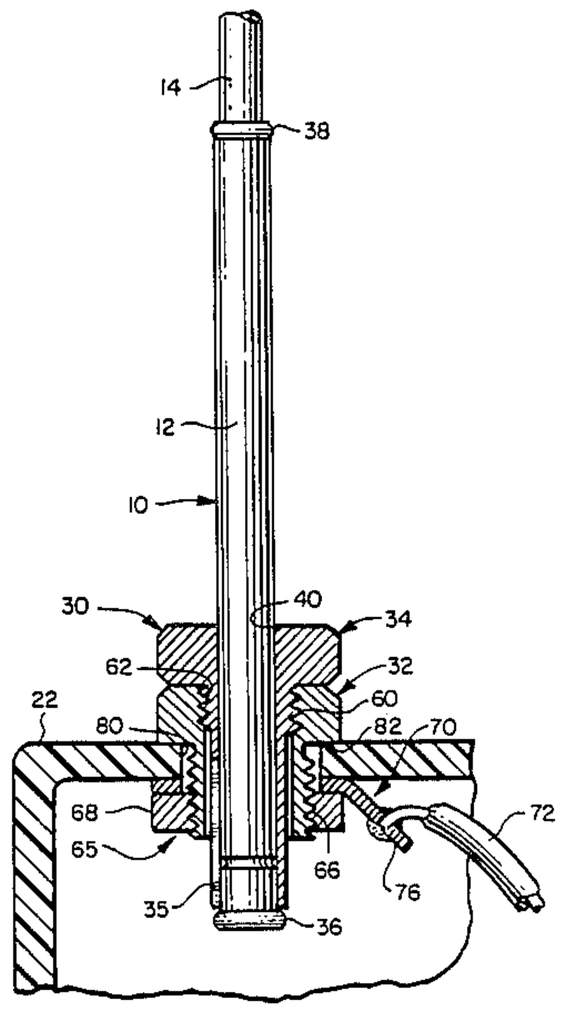
[57] **ABSTRACT**

A removable rod antenna comprises a first fitting for rigidly coupling to a radio body; an elongate rod-like antenna body; a second fitting of complementary configuration for engaging the first fitting, and a retaining arrangement for holding the second fitting in captive relation on the antenna. Respective mating fastener portions are defined respectively on the first and second fittings for removably engaging each other in electrically conductive contact to thereby removably mount the antenna body to the radio body in electrically conductive contact with the first fitting thereon.

8 Claims, 2 Drawing Sheets



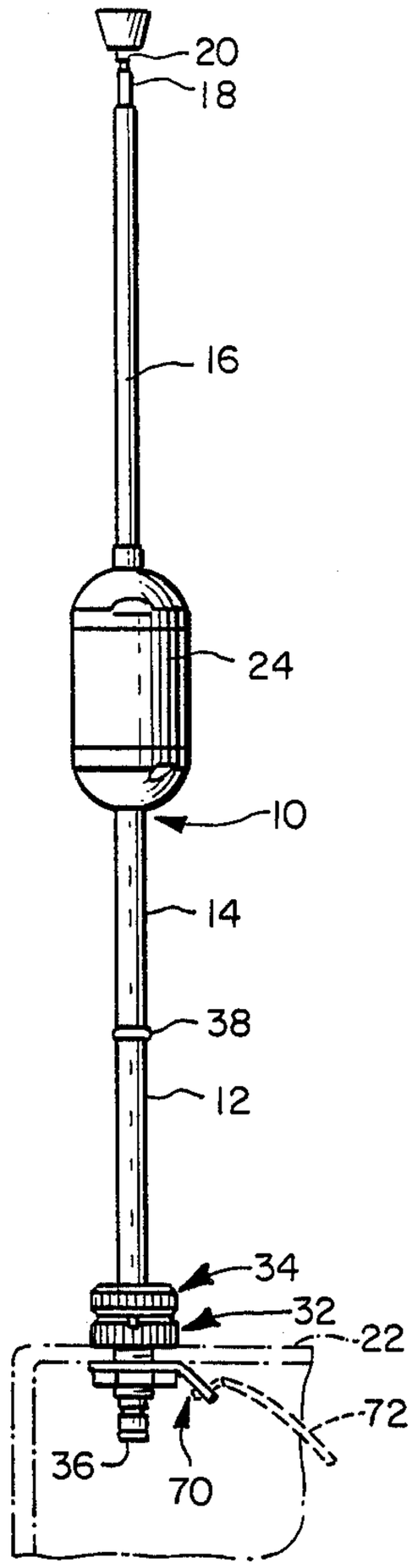


FIG. 1

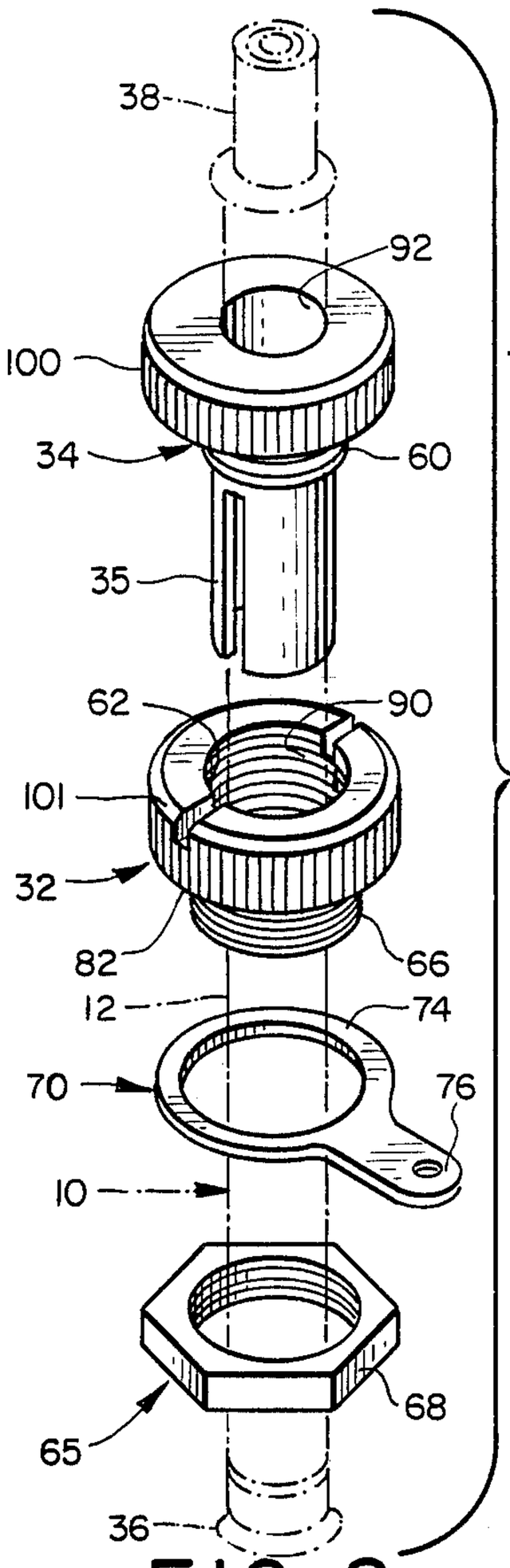


FIG. 2

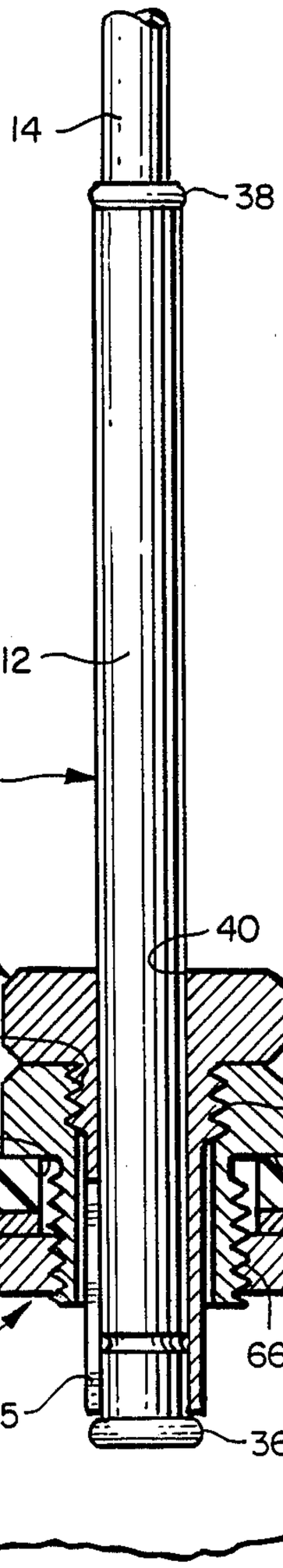


FIG. 3

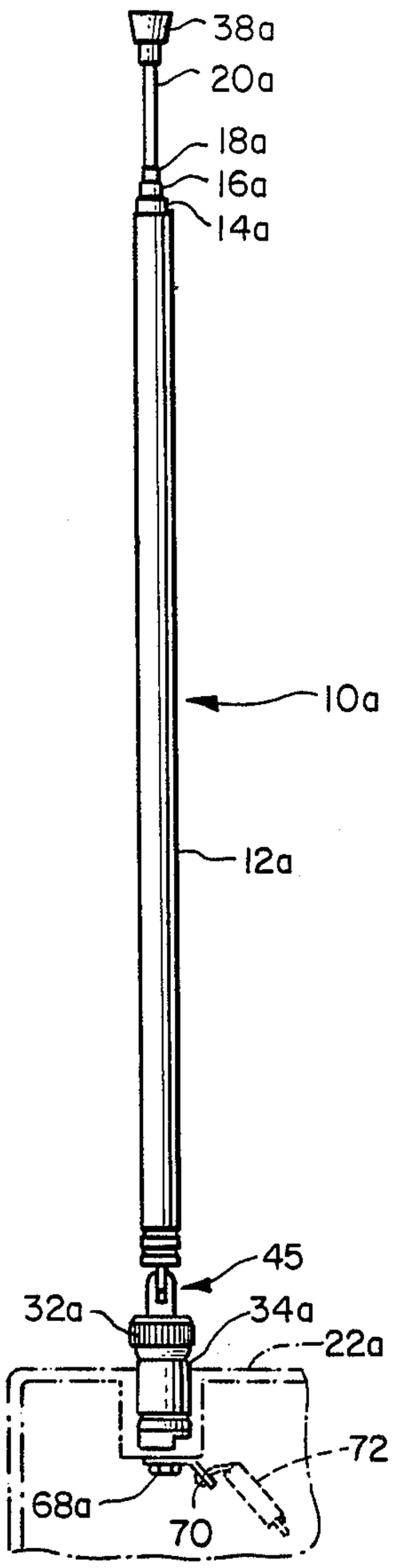


FIG. 4

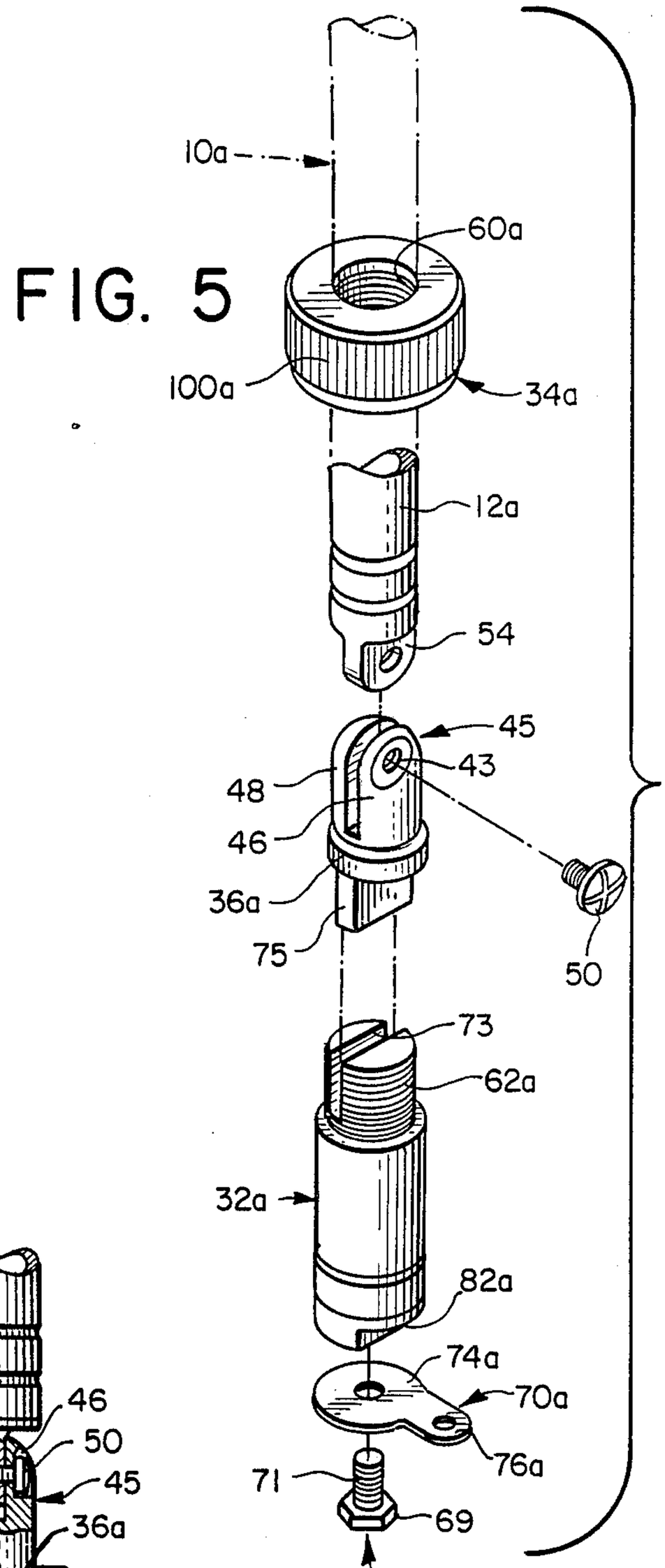


FIG. 5

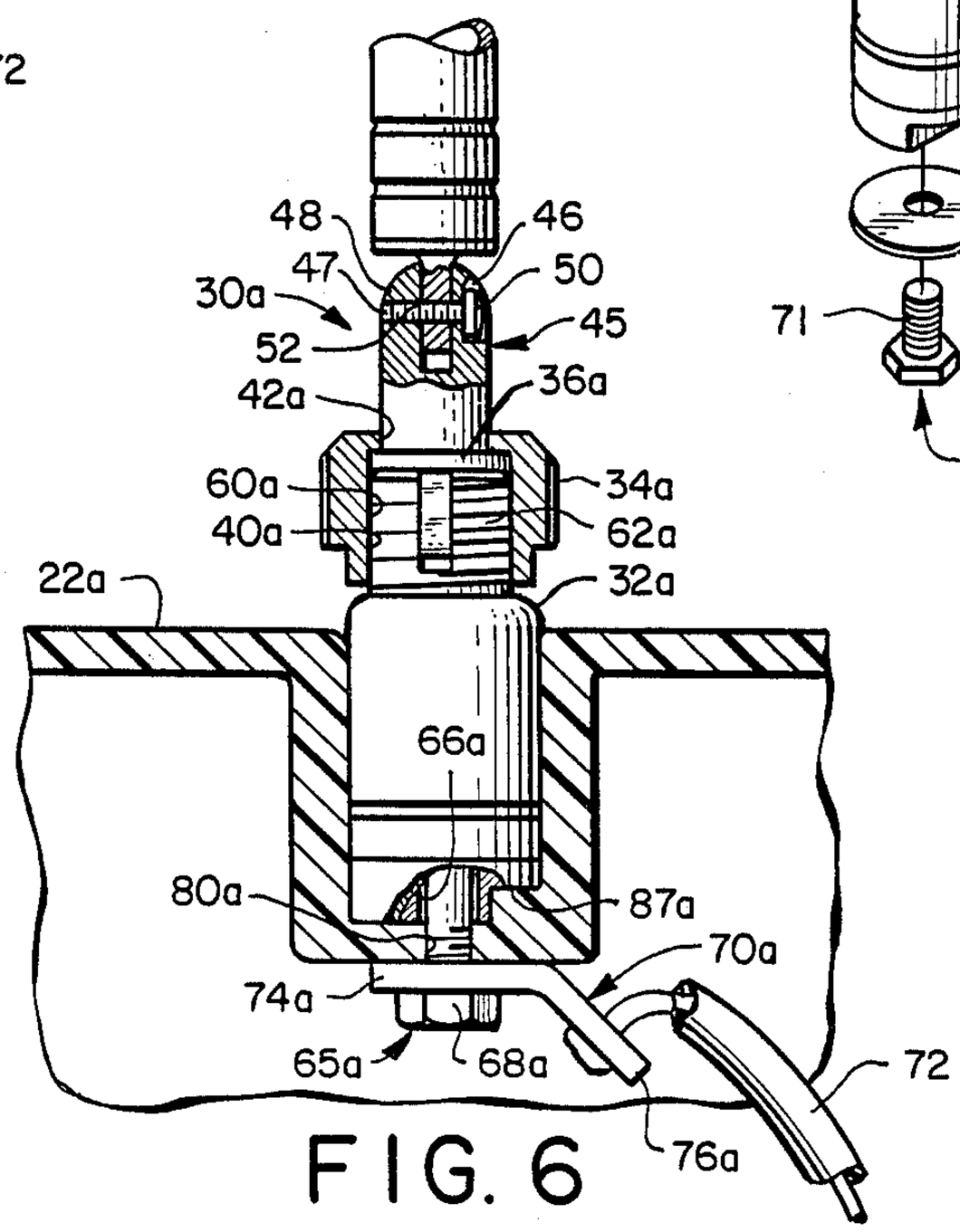


FIG. 6

REMOVABLE ROD ANTENNA

BACKGROUND OF THE INVENTION

This invention is directed generally to radio antennas and more particularly to a novel and improved removable rod-type antenna which may be readily attached to a radio body or detached therefrom as desired.

Still more particularly, the invention provides a novel antenna which is adapted to be attached to or detached from the radio body completely manually and without the need for any tool or the like.

Many radio receivers and transceivers are equipped with elongate generally cylindrical rod-type antennas. Many of these antennas are of the telescoping variety. That is, a plurality of decreasing diameter cylindrical sections are telescopically coaxially nested to be extended and retracted to a desired length relative to the radio body. Some of these antennas are mounted so as to allow either partial or complete retraction thereof within the radio body itself. Still others are mounted either rigidly or to flexible spring-like mountings in whip-like fashion and are not retractable. Yet other antennas are mounted pivotally so as to permit folding over thereof with respect to the radio body when not in use and folding back upwardly for telescopic extension when in use.

However, most of these prior art antennas have been non-removably mounted to the radio body. That is, these antennas are not readily manually removable from the body without use of some tools, and some knowledge of the construction thereof to permit removal without damage thereto or to the radio. Moreover, many radio constructions require that the radio body or case be opened or partially disassembled to gain access to the antenna and/or to lead wires connected thereto for disconnection by suitable tools to permit removal of the antenna.

It will be recognized that removal of the antenna may be desirable in many instances. For example, one may desire to install a new antenna of a different type or configuration upon an existing radio. Such replacement may be desirable due to damage or wear of the original antenna, or merely to replace it with an antenna of a different type, higher quality, or the like.

OBJECTS AND SUMMARY OF THE INVENTION

Accordingly, it is a general object of the present invention to provide a manually removable antenna arrangement for a radio receiver or transceiver apparatus.

A more particular object is to provide a manually removable rod antenna in accordance with the foregoing object which may be readily manually assembled or disassembled with the radio body completely manually and without the need for any specialized skill or the use of any tools.

A related object is to provide a manually removable antenna structure in accordance with the foregoing objects which is relatively simple and straightforward to use and highly reliable in operation.

Briefly and in accordance with the foregoing objects, a removable rod antenna according to the present invention comprises first fitting means for rigidly coupling to a radio body; elongate rod-like antenna means for receiving radio signals; second fitting means of complementary configuration for engaging said first fitting means, and retaining means for holding said second fitting means in captive relation on said antenna means. Respective mating fastener means are defined respectively on said first fitting means and said second fitting means for removably engaging each other in electrically conductive contact to thereby removably mount said antenna means to said radio body in electrically conductive contact with the first fitting means thereon.

BRIEF DESCRIPTION OF THE DRAWINGS

The features of the present invention which are believed to be novel are set forth with particularly in the appended claims. The organization and manner of operation of the invention, together with further objects and advantages thereof, may best be understood by reference to the following description taken in connection with the accompanying drawings in the several figures of which like reference numerals identify like elements, and in which:

FIG. **1** is an elevational view of a removable rod antenna in accordance with a first embodiment of the invention, with a portion of a radio body to which it is mounted indicated in phantom line;

FIG. **2** is an enlarged, exploded partial perspective view of the antenna of FIG. **1**;

FIG. **3** is an enlarged side elevation, partially in section, illustrating further details of the mounting of the antenna of FIGS. **1** and **2** to a radio body;

FIG. **4** is a side elevation similar to FIG. **1** illustrating a second embodiment of a removable rod antenna in accordance with the invention, with a portion of a radio body to which it is mounted indicated in phantom line;

FIG. **5** is an enlarged, exploded partial perspective view illustrating details of the assembly of the antenna of FIG. **4**; and

FIG. **6** is an enlarged side elevation, partly broken away and partly in section, illustrating further details of the antenna of FIGS. **4** and **5** mounted to a radio body.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENT

Referring now to the drawings and initially to FIGS. **1** through **3**, a removable antenna in accordance with a first embodiment of the invention is illustrated. The remaining FIGS. **4** through **6** illustrate a second embodiment of an antenna in accordance with the invention, whereby like reference numerals, together with the suffix a are utilized in FIGS. **4** through **6** to indicate elements thereof which perform similar functions to the similarly designated elements of the embodiment of FIGS. **1** through **3**. In this regard, it will be appreciated from the following description that the two forms of antenna shown in FIGS. **1** through **3** and FIGS. **4** through **6** respectively have many common features, although structural details thereof differ in some respects.

The antenna of FIGS. **1** through **3** will be seen to comprise a telescoping rod-type of antenna designated generally by the reference numeral **10** and comprising a plurality of telescopically nested antenna segments **12, 14, 16, 18** and **20** of decreasing diameter. The antenna of FIG. **4** also comprises such a telescoping antenna as generally indicated by reference numeral **10***a* and similarly indicated telescopically nested segments **12***a*, **14***a*, **16***a*, **18***a* and **20***a*. Both antennas are mounted for extension and retraction both by the telescoping extension and collapsing of the segments thereof and by other

means, relative to a radio body or housing **22** which is only partially indicated in the drawings. In this regard, the antenna of FIGS. **1** through **3** is slidably mounted to a fitting structure **30** in accordance with the invention so as to be slidably movable inwardly and outwardly relative to the interior of the housing or radio body **22**. On the other hand, a second fitting structure **30***a* in accordance with the second embodiment of the invention shown in FIGS. **4** through **6** pivotally mounts antenna **10***a* to radio body or housing **22***a* so as to be collapsible and extendable by pivotally folding over the antenna relative to the radio housing or body.

Moreover, the antenna **10** of FIGS. **1** through **3** has a loading coil **24** mounted thereto at a suitable mid portion of the telescoping body **10**, and specifically about an upper portion of segment **14**, for extending the effective length thereof. On the other hand, the telescoping antenna of FIGS. **4** through **6** is not of this type and hence not so constructed having no loading coil.

Turning now to the fitting structure or assembly **30** for assembling the antennas **10** and **10***a* to the radio bodies **22** and **22***a*, it will be seen that these fittings, although different in their details, are functionally similar. Accordingly, first fitting means **32**, **32***a* are rigidly coupled with the radio body in a manner to be more fully described later. Second fitting means **34**, **34***a* are held in captive relation on the antenna body **10**, **10***a*, also in a manner to be more fully described later. These second fitting means **34**, **34***a* are of a complementary configuration for removably engaging the respective first fitting means **32**, **32***a*.

Retaining means for holding the respective second fittings **34**, **34***a* on the antenna bodies **10**, **10***a* generally comprise increased diameter lower end portions **36**, **36***a* at one end portion of the antenna bodies and a second increased diameter portions **38**, **38***a* on a location axially spaced from portions **36**, **36***a* on the antenna body. In the embodiment of FIG. **3**, the fitting **34** has a central through bore **40** which is slidably engaged with the largest or base antenna segment **12**. The end stop **36** comprises an increased diameter knob-like member which may be engaged by a press fit or otherwise with a lowermost end of segment **12**. The second retaining means or stop comprises a similar enlarged diameter portion **38** formed at an opposite end of segment **12**.

In the embodiment of FIGS. **4** through **6**, the second fitting means **34***a* has a similar through bore **40***a* which has a decreased diameter radially inwardly extending shoulder portion **42***a* at its uppermost portion. This shoulder **42***a* engages an increased diameter radially outwardly extending shoulder portion **36***a* formed on a bracket member **45** to which the antenna body **10***a* is pivotally mounted. In this regard, bracket **45** comprises a pair of parallel and spaced apart upstanding legs **46**, **48**, of which have aligned through apertures **43**, **47** at least one of which is threaded to receive an externally threaded fastener or screw **50** therethrough. Preferably, the leg **48** is provided with the threaded tapped aperture **52** to receive the screw **50**. Cooperatively, a bottommost portion of antenna segment **12***a* is provided with a downwardly extending through apertured tab or ear **54** which readily interfits intermediate upstanding members **46** and **48** and accepts the body of screw **50** therethrough so as to render the antenna **10***a* pivotally movable relative to bracket **45**. The bracket **45** is also keyed to the first fitting **32***a* for non-rotatable mounting relative thereto. In this regard, first fitting **32***a* has its externally threaded portion **62***a* slotted as indicated at **73** to receive a downwardly extending complementary formed tab or ear **75** of bracket **45**.

Hence, as previously mentioned, it will be seen that the antenna of FIGS. **1** through **3** is slidably partially retractable within the housing or radio body **22** while the antenna of FIGS. **4** through **6** is collapsible by pivotally collapsing the antenna into a flat condition against the radio body or housing **22***a*.

In accordance with a further feature of the invention, mating coupling means comprising respective mating threads **60**, **62** and **60***a*, **62***a* are formed respectively on the first and second fitting means **32**, **34** and **32***a*, **34***a* for engaging each other in electrically conductive contact. This serves to removably mount the antennas **10** and **10***a* to the radio bodies **22** and **22***a* in conductive contact with the first fitting means **32**, **32***a* which are respectively rigidly mounted to the radio bodies or housings. Both of the fitting assemblies **30**, **30***a* mount terminals **70**, **70***a* interiorally of the radio body or housing to accomodate an electrical conductor or lead wire **72** from the antenna to the radio circuits. Accordingly, terminal mounting means designated generally by reference numerals **65**, **65***a* mount the respective terminals **70**, **70***a*. It will be seen that both terminals **70** and **70***a* generally comprise annular bodies **74**, **74***a* having radially outwardly extending connector portions **76**, **76***a*. Cooperatively, the terminal mounting means **65**, **65***a* comprise a first threaded fastener portion **66**, **66***a* formed on the first fitting means **32**, **32***a* and a mating threaded fastener **68**, **68***a* of complimentary form for mating with the threaded fastener portions **66**, **66***a* respectively. It will be seen that one of these mating fastener members or portions are externally threaded and the other internally threaded, the externally threaded one being of complimentary outer diameter for receiving the annular member or portion **74**, **74***a* of the terminal therearound. Moreover, upon advancement of the threaded fastener **68**, **68***a* relative to the threaded fastener portion **66**, **66***a*, the annular portion **74**, **74***a* is engaged in electrically conductive contact with at least the threaded fastener **68**, **68***a*.

The threaded fastener **68** of the embodiment of FIGS. **1** through **3** comprises a nut-like internally threaded fastener member which engages with an externally threaded portion **66** of fitting **32**. In the embodiment of FIGS. **4** through **6**, the threaded fastener **68***a* comprises a screw or bolt-like externally threaded fastener member having an enlarged head portion **69** for engaging the terminal member **70***a* and a threaded shank portion **71** for threadably engaging internally threaded portion **66***a* of fitting **32***a*.

The externally threaded portion **66** of the embodiment of FIGS. **1** through **3** further extends through a through aperture **80** in the radio body **22**. In similar fashion the externally threaded shank portion **69** of fastener **68***a* extends through a through aperture **80***a* in the radio body **22***a* of the embodiment of FIGS. **4** through **6**. Cooperatively, the annular portions **74**, **74***a* of terminal members **70**, **72** are respectively of a diameter at least as great as the cross-sectional dimension of the associated through aperture **80**, **80***a* for receiving the respective externally threaded members therethrough. Cooperatively, the first fittings **32**, **32***a* have respective enlarged diameter shoulder portions **82**, **82***a* for engaging the radio body at one end of the through apertures **80**, **80***a*. Hence, the radio body is engaged about this through aperture between the terminal annular portion **74**, **74***a* on the one side and the shoulder

portion **82**, **82***a* on the other side when the fastener member **68**, **68***a* is fully advanced relative to the first fitting member **32**, **32***a*. This full fastener advancement also results in the rigid mounting of the first fitting **32**, **32***a* to the radio body **22**, **22***a*.

In the embodiment of FIGS. **1** through **3**, the first and second fittings **32**, **34** have coaxially alignable through openings **90**, **92** which extend respectively interiorally of the radio body **22** when the fittings are mounted thereto as illustrated in FIGS. **3**. Preferably, the later opening **92** extends through a downwardly depending split sleeve or skirt portion **35**. This skirt **35** is provided to facilitate the slidably mounted movement of second fitting **34** relative to segment **12** of the antenna body **10**. This skirt **35** is sized so as to resiliently grippingly engage antenna segment **12** so as to hold antenna segment **12** is a fixed position relative to fitting **34** when the latter is assembled with fitting **32** and coupled with the radio body as shown in FIG. **3**. This engagement between skirt **35** and antenna body segment **12** also defines the amount of retraction of the antenna body **10** relative to the radio body **22**. Accordingly, the antenna body **10** is slidable with respective to the aligned through openings **90**, **92** for at least partial retraction thereof within the radio body **22** as previously mentioned.

On the other hand, as mentioned with respect to the embodiment of FIGS. **4** through **6**, the mounting bracket **45** and pivotal mounting thereof by means of the screw or other fastener **50** permits the antenna **10***a* to be moved between a collapsed and extended position by pivoting relative to the radio body **22***a*.

Both of the second fitting means **34**, **34***a* have manually graspable means, in the form of peripheral knurled surface portions **100**, **100***a* for manually grasping to effect engagement and disengagement thereof with the respective first fitting means **32**, **32***a* manually and without the need for any tool or the like. In the embodiment of FIGS. **1–3**, fitting **32** is also provided with a knurl **101** to permit manual engagement and disengagement with nut **68**.

While particular embodiments of the invention have been shown and described, it will be obvious to those skilled in the art that changes and modifications of the present invention, in its various aspects, may be made without departing from the invention in its broader aspects, some of which changes and modifications being matters of routine engineering or design, and others being apparent only after study. As such, the scope of the invention should not be limited by the particular embodiment and specific construction described herein but should be defined by the appended claims and equivalents thereof. Accordingly, the aim in the appended claims is to cover all such changes and modifications as fall within the true spirit and scope of the invention.

The invention is claimed as follows:

1. a removable rod antenna comprising: first fitting means for rigidly mounting to a radio body; elongate antenna body means; second fitting means of complementary configuration to the configuration of said first fitting means for removably engaging said first fitting means; a retaining means for holding said second fitting means in captive relation on said antenna body means, such that the antenna is completely removed from the radio body both mechanically and electrically upon disengagement of the second fitting means from the first fitting means; and mating coupling means defined respectively on said first and second fitting means for casing the first and second fitting means to be engaged in electrically conductive contact with each other so as to thereby removably mount said antenna body means to said radio body and in conductive contact with said first fitting means which first fitting means is rigidly mounted to the radio body; a terminal comprising a generally annular member having a radially outwardly extending connector portion; and terminal mounting means comprising a first threaded fastener portion formed on said first fitting means and a threaded fastener of complementary form to, and for mating with, said first threaded fastener portion; one of said first threaded fastener portion and said threaded fastener comprising an externally threaded member of complementary outer diameter to, and for receiving, said annular member closely fitted therearound and, for engaging said annular member in electrically conductive contact with at least said threaded fastener and for rigidly coupling said first fitting means to the radio body; wherein said antenna body means comprises an elongate cylindrical body; wherein said second fitting means has a generally cylindrical, depending, slotted skirt for frictionally engaging and slideably receiving said elongate cylindrical body therethrough; and wherein said retaining means includes respective increased diameter portions at axially spaced locations on said antenna body means of diameter greater than that of said depending skirt of said second fitting means.

2. An antenna according to claim **1** wherein said mating coupling means comprises a threaded portion on said first fitting means and a mating threaded portion on said second fitting means for threaded engagement with the threaded portion on said first fitting means.

3. An antenna according to claim **1** wherein said antenna body means comprises a plurality of telescopically engaged antenna sections, said second fitting means being slideably engaged about an outermost one of said sections.

4. An antenna according to claim **1** wherein said first and second fitting means have complementary engageable threads thereon comprising said mating coupling means and wherein said second fitting means further includes a shoulder portion for engaging the first fitting means as the second fitting means is advanced relative to the first fitting means, thereby defining maximum advancement of said second fitting means relative to said first fitting means.

5. An antenna according to claim **1** wherein said first and second fitting means have coaxially alignable through openings, said through opening of said second fitting means extending interiorly of said radio body, said antenna body means being slideable with respect to said aligned through openings for at least partial retraction thereof within said radio body.

6. An antenna according to claim **1**, wherein said second fitting means includes manually graspable means accessible to an operator for engagement and disengagement thereof with said first fitting means manually and without the need for any tool or the like.

7. An antenna according to claim **4** wherein said second fitting means is externally threaded and has a shoulder portion extending radially outwardly of said external thread.

8. An antenna according to claim **5** wherein said retaining means comprises respective increased diameter portions at one axial end of said antenna body means and at a location thereon axially spaced from said one axial end, and of greater diameter than the diameter of said second fitting means through opening.

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